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A477 Trunk Road St Clears to Red Roses Improvement

Road opening by Edwina Hart MBE CStJ AM,
Minister for Economy, Science and Transport, 16 April 2014





Overbridge carrying a local side road

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Foreword

I welcome the completion of the A477 St Clears to Red Roses improvement project, which includes bypasses for the communities of Llanddowror and Red Roses. Its completion makes a significant contribution to the Welsh Government's aim of ensuring that our infrastructure provides an adequate level of service for journeys within Wales, as well as providing links to destinations.

Ensuring that key projects such as this one are delivered has been a key priority for the Welsh Government. In my July 2013 written statement to Assembly Members I emphasised that transport has a critical role to play in improving Wales' economic competitiveness and provides enhanced access to jobs and services. I also stated that 'I will continue to deliver key schemes already under construction,' of which A477 St Clears to Red Roses Improvement is one.

The project provides a key improvement to the A477 trunk road which is part of the Trans European Road Network and is an important strategic route in south Wales and with the A40 trunk road provides the *land bridge* linking the rest of the UK and Europe to west Wales and Ireland via the ferry ports at Pembroke Dock and Fishguard. This project and the recently completed improvement at Penblewin Slebech on the A40, are part of a programme of targeted investment in infrastructure that was announced in the National Transport Plan 2010, and will improve accessibility to the Haven Waterway Enterprise Zone. There will also be improved access to the tourist centres of Tenby, Saundersfoot and south Pembrokeshire, which should assist their local economy. Overall the project will improve reliability, journey time, safety and local environmental issues between key settlements in west Wales and enhance international connectivity thus helping to meet Wales' wider economic needs in a cost effective manner.

This project provides improved overtaking opportunity using a wide single 2+1 road layout which will improve journey time reliability and road safety. I am pleased that the design and construction work, undertaken by the SRB Civil Engineering team, has delivered the project successfully. I am also impressed by the measures taken by the team to deliver the project with minimal environmental impact using sustainable construction techniques and best practice.

I am aware that the team have taken their responsibility to the community very seriously and that communications were maintained with the local community throughout the construction phase with the operation of an 'open door' policy led by the efforts of SRB's Public Liaison Officer, and supported by the whole team for which they are to be commended. SRB Civil Engineering registered the site with the Considerate Constructors Scheme at an early stage, and independent assessments have consistently placed the site in the top 5% of registered sites in the UK. The team was awarded a Bronze award in the Considerate Constructors Scheme National Site Awards in 2013, and a silver award at the recently announced 2014 awards.

I congratulate everyone involved on the delivery of this improvement project, which I am sure will be appreciated by many in years to come. This brochure serves as a permanent reminder of the work of all involved.



Edwina Hart MBE CStJ AM, Minister for Economy, Science and Transport



Earthworks operation at an early stage of the construction project



Work during various stages of the project



Partners for the Project

Promoter **Welsh Government**
Role **Employer**

The Welsh Government is the highway authority for the trunk road and motorway network in Wales and is the employer for the Project. The A477 St Clears to Red Roses Road Improvement was planned and constructed under the direction of the Welsh Government's Infrastructure Delivery Division, part of Economy, Science and Transport.

The project partners listed below have been involved in the A477 St Clears to Red Roses project since 2009, when SRB Civil Engineering were appointed to take the proposal from preferred route through design development, statutory procedures including a Public Local Inquiry and Construction. It has been an exciting, challenging and rewarding project that all are proud to have been involved with and proud to have been an integral part of its delivery.

Company **Hyder Consulting Ltd**
Role **Employer's Agent**

Hyder Consulting is an independent engineering and environmental consultancy and, with a heritage that spans more than 150 years, it is one of the world's longest established engineering consultancies. It has a global workforce of nearly 4000. Highways and transportation is a core business area for Hyder Consulting with a large proportion of the company's professional staff providing an integrated approach to the planning, environmental management and engineering design of projects. The company has a long history of delivering major highway projects in Wales from its Cardiff office and is a leading player in the UK wide highways and transportation sector.

Company **SRB Civil Engineering**
Role **Main Contractor**

SRB is a joint venture company formed by two civil engineering contractors, Roadbridge and John Sisk & Son.

Roadbridge was formed in 1967 and specialises in the delivery of major civil engineering infrastructure projects, including transport, renewables and energy, utilities, commercial, industrial, waste management and leisure sectors. It is a family owned business and has developed partnerships with major international clients.

John Sisk & Son is a fifth generation, 150 year old family business. The company was founded in Ireland in 1859 and it has grown from a small local builder to an international construction company, now part of the strong and diversified Sisk Group.

Company **Ramboll**
Role **Contractor's Designers**

Ramboll is a leading engineering, design and consultancy company at the forefront of innovation. From across 200 offices they apply their engineering skills and passion to a wide range of projects around the world, combining their global skills base with an understanding of the local context, importance and driving factors of a project. The UK based team of specialists is able to draw upon the united global expertise of the practice in delivering industry-leading solutions from offices throughout the British Isles. In March 2011 Ramboll acquired Gifford, an interdisciplinary UK-based practice known for its cutting edge sustainability consultancy and for its work on major public sector projects. Gifford has now been fully integrated into the company.



Site safety team achievement - 500,000 hours worked without a lost time incident



Traffic on the old A477 trunk road



Traffic moving through Llanddowror prior to the construction of the new project

Background and Brief Project Description

The A477 forms part of an important strategic trunk road network serving:

- Ferry traffic using the port at Pembroke Dock;
- Tourist centres of Tenby, Saundersfoot and south Pembrokeshire; and
- Haven Waterway Enterprise Zone at Milford Haven

The Trunk Road is part of the Trans European Road Network that links mainland Europe with west Wales and Ireland via the ferry at Pembroke Dock. It is regularly used to transport

The road was built under an Early Contractor Involvement contract, which meant that the main contractor was involved at an early stage with the design of the road to ensure that practical considerations regarding the ability to construct were considered at an early stage of design.

abnormal loads including military vehicles, static caravans and industrial equipment. It also plays an important role in the local economy and road network.

Since the early eighties, the A477 trunk road has been improved to bring the road network up to modern standards, with the exception of the section between St Clears roundabout and Red Roses. This section of road has been substandard in terms of its alignment and cross section with poor visibility for drivers. The absence of verges or pull-in areas resulted in hazardous conditions for pedestrians and cyclists. Drivers also sometimes experienced significant delays and congestion when there were vehicle breakdowns. Maintenance operations were hampered due to the narrow road width and bends, restricting the safe positioning of traffic signals. It had also suffered closure as a result of accidents or fallen trees several times in recent years. Additionally, the trunk road, passing through the communities of Llanddowror and Red Roses, had an adverse impact on the quality of life of people living in those communities.

The former trunk road had followed the alignment of the River Hydfron within the steep-sided valley between Llanddowror and Red Roses. Local topography imposed constraints that precluded on-line improvement within the river valley and yet presented significant engineering challenges for the new off-line route.



Some of the bends through the wooded area between Llanddowror and Red Roses on the old A477



The Public Exhibition in 2010



2+1 road layout on new A477 road

The 9.6km project, bypassing the communities of Llanddowror and Red Roses, comprised the construction of 8.7km of off-line highway, mainly through agricultural land, between Pont Newydd Bridge and Red Roses. The single carriageway includes sections of 2+1 carriageway and climbing lanes to provide overtaking opportunities. This helps to improve safety and journey time reliability whilst reducing severance issues within the local communities. The earthworks operation involved the movement of nearly 1 million m³ of material, much of which was hard rock. New structures are provided at various locations to cross water features, maintain the local road, footpath and equestrian network and provide access to farms and other properties.

In addition to the anticipated engineering challenges, the contractor had also to overcome prolonged extremely wet weather, a period of heavy snow and the impact of unexpected archaeology, including the uncovering and subsequent investigation of an extensive bronze age cremation site of national importance.

The Project also includes 0.9km of on-line improvement works between St. Clears roundabout and Pont Newydd Bridge.



A section of the completed road

A Brief History of the Project

The requirement for a road improvement in the area was first identified over 20 years ago. Technical Advisors were appointed to investigate the need in greater depth in 1993, resulting in public consultations in 1995 and 2003. It was following these consultations that a proposed route was protected for planning purposes in 2006.

Competing priorities for improving the trunk road network meant that work didn't start until 2008 when the Welsh Government, following a tender process, appointed Hyder as Employer's Agent for the project. The design and construction team, SRB Civil Engineering and their designers Ramboll (formerly Gifford) were appointed in 2009, following a further tender process.

Draft Statutory Line and Side Roads Orders and an Environmental Statement were published in November 2010, followed by a Public Exhibition, which was held in St Clears in December 2010. The draft Compulsory Purchase Order was published in January 2011 and took into account issues raised at the Public Exhibition. Following a Public Local Inquiry in June 2011, an Independent Planning Inspector recommended that, subject to amendments, the Statutory Orders allowing the project to proceed should be made. The Orders were made in January 2012, and construction of the project commenced in February 2012.

Key Features

The project consists of 8.7km of new road constructed between Pont Newydd Bridge, east of Llanddowror, and Red Roses with a further 0.9km of improvement to the existing A477 trunk road between Pont Newydd Bridge and St Clears roundabout.

The road is a single carriageway with over half its length carrying three lanes in a 2+1 arrangement, allowing overtaking opportunities in both directions at set locations. The project has involved the construction of 17 structures (bridges, underpasses and culverts) to maintain the local highway, public footpath and equestrian network and to provide access to local farms, farmland and properties. Culverts are also provided for the safe passage of wildlife under the road.

A footway / cycleway has also been constructed from Pont Newydd Bridge to Llanddowror to link the communities of St Clears and Llanddowror.

'It will allow villagers to have a better, safer, quieter and pollution free life'

(Llanddowror Community Council during the Public Inquiry)



Aerial view of the latter stages of the construction project



Tenby and part of the Pembrokeshire Coast National Park - key tourist destinations for traffic using the A477



Achievement of the Project's Objectives

A number of strategic aims and specific objectives were set for the project. Transport has a critical role to play in improving Wales' economic competitiveness and transport improvements are undertaken to address the needs of business, people and communities.

Improving Wales' Economic Competitiveness

Objectives:

- Improve links to west Wales, Ireland, the English trunk road network and Europe;
- Improve regional accessibility and mobility;
- Bring up to standard and maintain the function of the trunk road network;
- Help meet Wales' wider economic needs in a cost effective manner;
- Monitor and reduce journey time variability on the trunk road network

This strategic aim and its objectives have been met by the construction of a modern highway.

The improved section of the A477 will provide more efficient road connections to the important tourism and energy enterprises in Pembrokeshire, and enable more effective connections with Ireland via Pembroke Dock.

The new section of road has been designed and constructed to current highways standards, allowing for good forward vision and increased opportunity for safe overtaking via the 2+1 layout.

Journey time reliability will be monitored on opening the road. It is expected that the provision of a wider carriageway with a much improved alignment will lead to far better journey time reliability. Delays or even road closures due to accidents, flooding, fallen trees or maintenance was a major issue with the old trunk road.



The completed Tavernspite Road arch bridge north west of Llanddowror



The team worked with landowners to ensure farms were able to operate effectively during and after construction



Monitoring vibration and noise levels



Dust suppression measures

Community Enhancement

Objectives

- Reduce severance caused by traffic for communities on the A477 in west Wales;
- Contribute towards safer communities, including managing the speed of traffic to appropriate levels;
- Improve safety generally, but particularly, on the A477;
- Improve the quality of life of people in communities close to the trunk road network;
- Promote cycling and walking and provide opportunities for healthy lifestyles;

The lives of people in the communities of Llanddowror and Red Roses in particular will be significantly enhanced by taking away the through-traffic that had been travelling through these villages. The local traffic will continue to use the existing road through the two villages but with significantly reduced traffic volumes.

Consequently, the quality of life for those living within the two villages will be improved due to lower noise levels and pollution levels. Safety for pedestrians will also be significantly enhanced.

The provision of a new footway / cycleway linking Llanddowror to St Clears will promote increased levels of cycling and walking for those living locally



Footpath / cycleway between St Clears and Llanddowror

Mitigating Potential Impacts

Objectives

- Minimise any adverse effect on the environment generally;
- Conserve and enhance, where appropriate, landscape, townscapes and historical and cultural resources;
- Conserve and enhance, where appropriate, biodiversity on the network through the Biodiversity Action Plan
- Take into account the needs of agriculture.

As well as delivering the key benefits set out earlier in this document, the project was also designed to minimise potential negative impacts. These objectives were met through careful planning in the design phase. Further opportunities to minimise impact were identified and implemented as works progressed during the construction phase. For example, where it was identified on the ground that fewer trees or hedgerows needed to be removed to accommodate the design, they were left in place.

During the design and construction phases, care was taken to keep to a minimum the impact on the environment, landscape, heritage and land users.

At the design phase, opportunities were identified to move existing hedges to new locations, rather than simply remove them. Over 1600m of hedgerow was moved in this way, ensuring that flora and fauna in those hedgerows were retained and re-established.

Detailed archaeological surveys were undertaken during the design phase, and again during the early phases of construction to ensure that archaeological and heritage features were identified and recorded.

The detailed work to conserve the heritage and ecological resources of the area is explained on pages 17-21.

The team worked closely with local landowners impacted by the project during the design and early construction phases to ensure that their needs were taken into account. This ensured that they could continue their farming operations during and after the construction of the project. Five underpasses and two accommodation bridges were constructed to enable full access for farm traffic. Gates, farm access tracks and livestock pens were also constructed where recommended by an agricultural specialist and the Planning Inspector, and in consultation with landowners.



Trimming the earthworks formation prior to road construction was guided by GPS satellite technology

Constructing the Project

The A477 St Clears to Red Roses Improvement in 20 Numbers

Length of road constructed or improved	9.6km
Length of stock proof fencing	12km
Length of utilities diverted and protected	13.5km
Number of structures built	17
Length of mammal protection fence	18km
Length of drainage runs installed	25km
Number of Bronze age cremation urns found	70
Number of peak items of plant items including dump trucks and excavators	84
Number of local companies that have provided services	140
Peak number of people who worked on the project	173
Total number of people who worked on the project	930
Length of existing hedgerow moved and replanted	1,620m
Length of new hedgerow planted	3,500m
Number of trees planted	45,157
Volume of stone processed on site	59,500m ³
Area of carriageway surfacing laid	162,300m ²
Volume of rock material moved	578,500m ³
Number of hours worked without a lost time incident / accident	612,317 hours
Total volume of earthworks including rock	898,100m ³
Estimated annual number of vehicles expected to travel on the road at the time of opening	2,628,000



Series of photographs showing the stages of construction of the main cutting near Llanddowror, along with the arch bridge carrying the Tavernspite road

The arch segments were cast on the ground below and either side of the bridge

Engineering Challenges

Designing the project presented a number of challenges. The main challenges identified by the designers were:

- Creating a road alignment design to achieve the following key factors:
 - Meet all current highway standards,
 - Avoid constraints such as residential properties and overhead cables
 - Addressing the need to divert key services such as water supply and safely protect gas and oil pipelines.
 - Balance cut and fill volumes, and avoid unnecessary import or disposal of material off site.
 - Minimise the impact on the environment and wildlife.
- Geotechnical considerations: The road project required the excavation of a large amount of rock material in order to create cuttings through which the road was constructed. The variability in nature and stability of rock and soil was a key challenge during the design and construction phase.
- Structures: 15 structures, including bridges and underpasses were built into the project, and a further two existing structures were upgraded. The design of the overbridge carrying the Tavernspite Road near Llanddowror within a 20m deep cutting was particularly challenging due to the skew angle and slope required by the sideroad alignment.

Construction Challenges

As the construction team moved on site in early February 2012 and proceeded to build the new road, they faced a number of challenges that would not have been foreseen during the design phase. The following are examples of the main challenges faced during the build phase:

Weather.

The weather conditions presented some of the bigger challenges during the construction phase. The team faced a very wet summer during 2012, forcing a number of reviews of the construction schedule. The wet weather also placed a greater than expected pressure on the plans to manage water run-off, and more resource was required to effectively control the level and quality of surface water entering the water courses from the construction site. Further information about this work can be found on page 20.

2012 was Wales' third wettest year on record, according to the Met Office, whose data also confirmed the winter of 2013 as the wettest on record.

Pipeline Protection

The new road crosses a high pressure gas pipeline. It also crosses an oil pipeline at a number of locations. To do so safely, protection measures were developed, which avoided the need to divert the pipelines. Over 640 metres of pipeline was protected in this way before the road could be constructed.

Ecological and Archaeological Assessment

The early stages of construction, in particular site clearance and removal of topsoil, was carried out under close supervision from ecologists and archaeologists. Whilst pre-construction surveys were carried out, the true extent of ecological and archaeological finds that needed to be considered could

not be fully appreciated until construction work started. Evidence of the existence of dormice habitat in the ancient woodland near Llanddowror and a significant archaeological find in the same area led to the need to re-programme work as mitigation works were carried out before road construction works could continue.

The Tavernspite Road Arch Bridge

The arch sections were pre-fabricated on specially prepared beds within the main earthworks cutting. These were lifted into position onto temporary trestle supports and stitched together in situ. The trestle support was then replaced with a suspended working platform to allow the earthworks and structure to be constructed in tandem.



Finished Tavernspite Road arch bridge



Detailed exploration was carried out at identified sites



Archaeologists explore a burnt mound layer by layer



Bronze Age cremation burials



Archaeologists explore a potential new find

The Past Uncovered

It was identified early in the life of the project that there was the potential to impact upon archaeological remains in the area including the loss of parts of the Scheduled Monument at Dol Garn (prehistoric / early Roman remains) near Pont Newydd Bridge.

The objective of the project's archaeological works was to record for future generations the

presence, nature and extent of any remains of human activity disturbed during the works.

Based on known and potential archaeological resources, works were undertaken at specific identified sites throughout the project to ensure the objectives were met. These included geophysical surveys, palaeoenvironmental trenching, archaeological strip, map and sample excavations and archaeological controlled watching brief during the topsoil strip.



Archaeologists start to uncover a burial urn



Trenches dug along the route

The archaeological watching brief carried out between Llanddowror & Red Roses identified widespread evidence of human activity relating to the prehistoric period, particularly the Bronze Age. Evidence of agriculture, domestic occupation and ritual landscapes were discovered. Within the wide number of features identified and recorded was a group of Bronze Age cremation burials. These remains are considered by all parties involved in the project to be of national importance and, along with the other features identified, significantly improve the archaeological understanding of prehistoric activity in this area of Wales.

Discovered alongside the cremation burials were other features including a funeral pyre, cist burials and a mini-henge structure. Finds of this complexity are rare and, when considered along with the nearby Neolithic Henge and Bronze Age Cemetery discovered during National Grid excavation works for the National Grid Pipeline in 2006, they comprise a comprehensive ritual landscape unparalleled in this part of Wales, providing a detailed and vivid image of domestic, agricultural and ritual use of the landscape in the Bronze Age.



Otter and reptile hols constructed on site



Water quality monitoring



Environmental tool box talk



Mammal protection fences erected alongside the road

Ecology and Environmental Protection

Throughout the construction period, the team worked hard to protect and enhance the environment and ecology of the site. In addition to the requirements identified in the Environmental Statement prepared for the project and the conditions detailed from the Public Local Inquiry a number of other initiatives were carried out. Due to exceptionally challenging weather conditions

during construction, the team had to deal with large volumes of silt-laden surface water. An innovative approach was adopted using technology developed by a local company in Llanelli - Hydro Industries. An electrical current was introduced into the silt-laden water to cause the silt to settle. SRB worked closely with Hydro Industries and Natural Resources Wales (NRW) to ensure that surface water mitigation measures in place were capable of maintaining site discharges within acceptable limits. This is one of the first times that such technology has been used on a construction project in the UK.



Hedge moved and replanted to enable early re-establishment

To enhance the site appearance, the entrance to the main compound was developed as a bee garden. With assistance from Esteam (a local group of adults with learning disabilities), the area was planted up with bee-friendly plants (purchased from a small, independent nursery near Carmarthen) while pupils from Tavernspite School helped to paint the hoardings with bees, butterflies and flowers. Over the summer months, the colourful blooms attracted many different insects, and many compliments from visitors. Although a small initiative, it helped to meet the objectives of the Welsh Governments Action Plan for Pollinators and also demonstrated what could be done to enhance the environment on a construction project. The plants will be donated to Tavernspite School and Red Roses & Llanddowror Community Gardens.

Waste management was built into the project at the start of its design. This involved the detailed identification of those activities and elements that had potential for creating large waste volumes e.g. Japanese Knotweed areas and surplus materials. Through several iterations of the design, many of these elements were designed into the works or significantly reduced. In the case of Japanese Knotweed, a number of cells were designed in embankment areas so that this invasive weed could be safely retained within the land purchased for the project, eliminating the need for any of this material to be disposed of off-site.

Also, during the design phase, waste streams were identified and estimated quantities calculated. Waste was managed using the WRAP (Waste and Resources Action Programme) Site Waste Management Plan (SWMP) to ensure that the waste supply chain used the correct permissions and permits that met legal requirements. This process allowed tracking of waste producing activities and waste streams to identify potential areas where waste could be reduced e.g. road planings used in footpath construction.

91% of all waste generated was diverted from landfill during the project construction phase. Surplus material was also used for appropriate local uses, for example clay excavated during the site clearance stage was used at Nantycaws landfill site as capping material.



Donation made to the Cardiac Risk in the Young charity following a tractor run.



Tavernspite School pupils painting the site entrance bee garden

Working with the Local Community

During the two years of construction, the team endeavoured to be a good neighbour to the local communities affected by the construction programme.

As part of its commitment to be a good neighbour and responsible contractor, the site team registered the project with the Considerate Constructors Scheme (the national initiative set up by the construction industry to improve its image), which meant that an external assessor regularly visited the site to monitor how the project was managed in five key areas:

- Enhancing site appearance
- Respecting the community
- Protecting the environment
- Securing safety
- Caring for the workforce.

The project has consistently scored well in the assessments, with the most recent score of 43 placing it in the 'Exceptionally good site' category and also in the top 5% of all construction sites registered with the scheme in the UK, and earning it a silver award in the recent Considerate Constructors National Awards 2014.

Along the length of the construction project, the construction team promoted the early establishment of grass on the embankments as the works progressed. This initiative reduced the visual impact of the cuttings and had the added effect of reducing the run off of silty water over the bare earth embankments.

The construction team enjoyed an excellent working relationship with the local community. A range of initiatives were undertaken to involve local communities in the project and also provide support for local organisations and good causes. The team worked proactively with local primary schools in the area to deliver messages about



A charity tractor run through part of the project



Job opportunities for long-term unemployed people



Individuals from Esteam with the project team

safety around a major construction site. The civil engineers of the future were also encouraged through the use of the Institution of Civil Engineers' Bridge to Schools initiative. This enabled local young people to gain a practical understanding of the principles of bridge building.

An open information room at the site compound, with a dedicated Public Liaison Officer along with a project website, www.a477scrr.com, ensured that people could always find information about the latest developments on the project. Motorists were able to get updates on new traffic management controls via a free text and e-mail service to alert them to new developments that would impact their travelling plans in the area. The Project team enjoyed an excellent working relationship and easy co-operation with key partners including Carmarthenshire County Council, Natural Resources Wales and the South West Wales Trunk Roads Agency (SWTRA).

The construction team worked on a number of initiatives in the local community during the two-year construction programme, including:

- Donating surplus construction material for local good causes
- Cleaning the local angling association's fishing platform
- Taking a roadshow around local schools to talk about construction site safety prior to the school summer holidays
- Using surplus resources from the site to upgrade the car parks at Tavernspite School and Red Roses community centre, working alongside Lafarge Tarmac
- Supplying flood storage containers for the local community at Llanddowror to store sandbags for use in the event of local flooding

With the number of workers on site reaching 173 at its peak within an 18km site boundary, securing everyone's safety has been a key priority. A continuous focus on site safety led to the team achieving over half a million hours of work without a time lost incident or accident.

Efforts to look after the workforce went beyond simply ensuring that everyone worked safely on site. The majority of the workforce were employed locally, and they were given the opportunity to gain experience and, were trained to develop key skills, ensuring a lasting legacy as a result of the project. Specialist labour was sourced from outside the local area. As part of a government scheme, long term unemployed people were employed and trained, so that their transferrable skills can be put to good use with other local employers after the completion of the project. Similarly, a number of civil engineering graduates from local Universities were employed and given valuable experience on the project. Extensive occupational health checks were given to site personnel as part of a 'Caring for the Workforce' programme implemented on the project.

'The pupils have benefitted from a number of great experiences that have added value to their education here at Tavernspite'

(Mr Phelps, Headmaster at Tavernspite Primary School)